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setting an exposure amount control target value in accordance with a transmittance of said optical system; and transferring said pattern onto said substrate through said optical system while an exposure amount is controlled based on said set exposure amount control target value.

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~~said measurement interval is set in accordance with an exposure condition.~~

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5. An exposure method according to Claim 3, wherein ~~said exposure condition includes one of a minimum line width~~

6. An exposure method according to Claim 2, wherein said measurement interval is changed in accordance with a variation amount between a transmittance obtained by a most recent transmittance measurement and a transmittance obtained by a measurement performed before said most recent measurement.

15 a prediction function determining to determine a transmittance time-varying prediction function for said optical system in accordance with an irradiation history of exposure light on said optical system, and

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$$T = a \cdot \exp \left(\sum_{i=1}^k b_i t_i \right)$$

in which T is said transmittance of said optical system, a is a parameter representing a rate of change in said transmittance, and b_i is a parameter dependent on each exposure condition including an illumination condition.

measuring a period of time in which said exposure
5 apparatus most recently stops operation;

measuring an exposure light intensity; and
10 measuring an irradiation amount.

11. An exposure method according to Claim 7, further
20 comprising:

corrects said transmittance time-varying prediction
function each time a transmittance measurement is performed.

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12. An exposure method according to Claim 11, wherein
said predetermined interval of said measuring said
transmittance is determined in respect to a relationship with

~~a required exposure precision.~~

13. An exposure method according to Claim 11, wherein
 said interval of said measuring said transmittance is
 5 short when a rate of change in said transmittance of
 said optical system is large, and
 long when said rate of change in said transmittance of
 said optical system is small.

10 *Sub A3* 14. An exposure method to transfer a pattern
 illuminated with exposure light from a light source onto a
 substrate through an optical system, said method comprising:
 setting measurement intervals in accordance with an
 exposure condition; and
 15 measuring a variation in the amount of said exposure
 light passing through said optical system in said set
 measurement intervals.

20 *Sub B4* 15. An exposure method according to Claim 14, wherein
 said exposure condition includes at least one of an
 illumination condition to illuminate a mask, a transmittance
 of said mask, a minimum line width, and a permissible exposure
 amount error.

25 16. An exposure method to transfer a pattern
 illuminated with exposure light from a light source onto a
 substrate through an optical system, said method comprising:
 measuring a variation in the amount of said exposure

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changing said predetermined measurement intervals upon said measuring, in accordance with a comparison result of a variation of a first measurement of said light amount and a variation of a second measurement of said light amount.

18. An exposure method according to Claim 16, wherein said first and second measurements are performed after starting of exposure.

20 a self-cleaning to clean said optical system by
irradiating said optical system with said exposure light on
a predetermined condition prior to exposure;

setting said exposure amount control target value based
on said determined transmittance time-varying prediction

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21. An exposure method according to Claim 19, wherein
said predetermined condition includes an irradiation time of
said exposure light on said optical system, said exposure light
intensity, and an irradiation amount.

setting a measurement interval in accordance with an exposure condition; and

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23. An exposure method according to Claim 22, further comprising:

obtaining a transmittance of said optical system in accordance with an amount of said exposure light which is measured before passing through said optical system, and said measurement result of said exposure light passing through said optical system.

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AS/ 24. An exposure apparatus to transfer a pattern
illuminated with exposure light from a light source onto a
substrate through an optical system, said exposure apparatus
comprising:

an exposure amount control system connected with said exposure amount setting unit to control an exposure amount based on said set exposure amount control target value.

a transmittance measurement unit which measures a
15 transmittance of said optical system, and
said exposure amount setting unit sets said exposure
amount control target value in accordance with said
transmittance measured by said transmittance measurement
unit.

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~~a control unit to set said measurement interval of said~~

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an information reading unit to read information of a mask on which the pattern is formed, and

29. An exposure apparatus according to Claim 26,
further comprising:

30. An exposure apparatus according to Claim 29, wherein two sequential measurements of transmittance by said transmittance measurement unit are performed prior to starting of exposure.

31. An exposure apparatus according to Claim 29, wherein two sequential measurements of transmittance by said transmittance measurement unit are performed after starting of exposure.

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Sub A1 32. An exposure apparatus according to Claim 25, wherein said transmittance measurement unit includes

a first optical sensor disposed in a light path of said exposure light to detect said amount of exposure light

10 irradiated on said pattern,

a second optical sensor arranged to be substantially flush with the substrate, and

a control unit connected with said first optical sensor and said second optical sensor to detect said amount of

15 exposure light passing through said optical system by using said second optical sensor at a timing which corresponds to an exposure condition, and to obtain a transmittance of said optical system based on said amount of exposure light and an

~~output from said first optical sensor.~~

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33. An exposure apparatus according to Claim 32, wherein said exposure amount control system controls said exposure amount based on said exposure amount control target value and said output from said first optical sensor when

25 transferring said pattern onto said substrate.

Sub A2 34. ~~An exposure apparatus according to Claim 32,~~

~~wherein said control unit detects said amount of exposure light~~

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having passed through said optical system at a timing which corresponds to a transmittance of said mask on which said pattern is formed.

5 35. An exposure apparatus according to Claim 32, wherein said control unit detects said amount of exposure light having passed through said optical system at a timing set in consideration of one of a minimum line width and a permissible exposure amount error.

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36. An exposure apparatus according to Claim 24, further comprising:

15 a first optical sensor disposed in said light path of said exposure light to detect said amount of exposure light illuminated on said pattern, and

 said exposure amount control system controls said exposure amount based on said exposure amount control target value and an output from said first optical sensor when transferring said pattern onto said substrate.

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37. An exposure apparatus according to Claim 24, further comprising:

25 a calculation unit to determine a transmittance time-varying prediction function of said optical system in accordance with an irradiation history of exposure light on said optical system, and

 said exposure amount setting unit sets said exposure amount control target value based on said transmittance

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a substrate stage disposed in an image plane side of
said projection optical system to hold said substrate, wherein
said optical system includes

5 an illumination optical system disposed in an
optical path of said exposure light to illuminate said
mask on which said pattern is formed with said exposure
light, and

10 a projection optical system disposed in said
optical path of said exposure light to project said
exposure light which exits from said mask onto said
substrate.

41. An exposure apparatus according to Claim 40,
15 further comprising:

a driving unit connected with said mask stage and said substrate to synchronously move said mask stage and said substrate stage in a linear direction perpendicular to an optical axis of said projection optical system.

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42. An exposure apparatus to transfer a pattern illuminated with exposure light from a light source onto a substrate through an optical system, said exposure apparatus comprising:

25 a measurement unit to measure a variation in an amount
of exposure light passing through said optical system; and
 a control unit connected with said measurement unit to
~~change intervals of said measurement performed by said~~

~~43. An exposure apparatus according to Claim 42,
wherein said measurement unit includes~~

~~a second optical sensor arranged to be substantially flush with said substrate.~~

44. An exposure apparatus to transfer a pattern illuminated with exposure light from a light source onto a substrate through an optical system, said exposure apparatus comprising:

a measurement unit to measure a variation in an amount of exposure light passing through said optical system; and

a control unit connected with said measurement unit to change an interval of a measurement performed by said measurement unit, in accordance with a comparison result of a variation of a first measurement of said light amount and a variation of a second measurement of said light amount.

45. An exposure apparatus to transfer a pattern illuminated with exposure light from a light source onto a substrate through an optical system, said exposure apparatus comprising:

a unit which communicates with said optical system to self-clean said optical system by irradiating said optical

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system with said exposure light in a predetermined condition
before starting of exposure;

a calculation unit connected with said unit to determine
a transmittance time-varying prediction function of said
5 optical system in consideration of said predetermined
condition; and

an exposure amount setting unit connected with said calculation unit to set an exposure amount control target value based on said determined transmittance time-varying prediction function.

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46. An exposure apparatus to transfer a pattern illuminated with exposure light from a light source onto a substrate through an optical system, said exposure apparatus comprising:

a measurement unit to measure an amount of exposure light passing through said optical system at a predetermined interval; and

20 a control unit connected with said measurement unit to
 set said interval of a measurement performed by said
 ~~measurement unit in accordance with an exposure condition.~~

47. A method of making an exposure apparatus to transfer a pattern of a mask onto a substrate, said method comprising:

providing an illumination optical system to irradiate
said mask with exposure light;

~~providing a projection optical system to project said~~

Method of

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51. A device manufacturing method including a lithographic process, wherein exposure is performed in said lithographic process by using said exposure method according to Claim 16.

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52. A device manufacturing method including a lithographic process, wherein exposure is performed in said lithographic process by using said exposure method according to Claim 19.

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53. A device manufacturing method including a lithographic process, wherein exposure is performed in said lithographic process by using said exposure method according to Claim 22.

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54. A device manufactured by using said exposure apparatus according to Claim 24.

55. A device manufactured by using said exposure apparatus according to Claim 42.

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56. A device manufactured by using said exposure apparatus according to Claim 44.

57. A device manufactured by using said exposure apparatus according to Claim 45.

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58. A device manufactured by using said exposure

apparatus according to Claim 46.

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